A Learning Alberta

Fostering Innovation in Alberta

A Discussion Document

July 2005

Alberta
ADVANCED EDUCATION

ALBERTA ADVANCED EDUCATION CATALOGUING IN PUBLICATION DATA

Alberta. Alberta Advanced Education.
Fostering innovation in Alberta.

ISBN 0-7785-4289-0

1. Higher education and state -- Alberta. 2. Postsecondary education -- Alberta -- Aims and objectives.
3. Education, Higher -- Alberta. 4. Universities and colleges -- Alberta.
5. Industry and education -- Alberta. I. Title.

LC176.2.A3.A333 2005 378.052

For additional copies contact:

Business Policy and Analysis Branch
Alberta Advanced Education
11th Floor, Commerce Place
Edmonton, Alberta
T5J 4L5
Telephone: (780) 427-5603
Fax: (780) 422-3688

To be connected toll-free call 310-0000

A Learning Alberta

Alberta will be a province where all Albertans have access to higher learning opportunities. It will be a province that aggressively seizes the opportunities of the future by leveraging the skills, talents and imaginations of its citizens. And it will be a province that will enjoy even greater success in the century ahead thanks to a solid foundation and legacy of higher learning that we will create together.

Albertans will be inspired to reach their full potential through advanced learning - to move beyond where they are now to where they can be. But most of all, Alberta will become a true learning province, where advanced education and lifelong learning is the cornerstone of a healthy, prosperous and progressive society.

Dave Hancock, Riverbend Ragg-Times

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1 Introduction

1.1 The *A Learning Alberta* Context

The Minister has initiated a comprehensive exercise to establish a new direction for Alberta's advanced education system. Through *A Learning Alberta,* a new vision and policy outcomes for the advanced education system will be articulated. The process provides an opportunity for government, stakeholders, and the public to consider how the advanced education system may be positioned and structured to create a learning society in Alberta. Embedded within the review process is the need to ensure opportunities are available for all Albertans to maximize their potential through higher learning.

This document provides an opportunity to consider important issues related to innovation in Alberta. *Unleashing Innovation* has been identified as a key pillar in the Government of Alberta's 20-year strategic plan, *Today's Opportunities, Tomorrow's Promise*. The government's vision for innovation includes stimulating Alberta's traditional economic foundation, creating new economic opportunities, and enhancing the quality of life for all Albertans.

However, sustaining high levels of innovation requires embedding a culture of innovation that is reflected in every aspect of life and work in Alberta. An innovative society is one that is able to explore and understand our changing world continuously, and see and grasp emerging opportunities. The overarching issue for the post-secondary review process relates to the role of the advanced education system in cultivating and enhancing innovation in Alberta.

1.2 Process and Feedback

This discussion document focuses on obtaining stakeholder feedback on how to foster innovation in Alberta. It provides a conceptual definition of innovation that expands beyond research and development activities, as well as providing a draft set of principles to potentially guide innovation in Alberta. It also begins the process of identifying key issues for consideration. A supporting document, *Profile of Alberta's Advanced Education System*, is available through *A Learning Alberta*, which provides additional data and information on research and innovation in Alberta.

The responses from this discussion document will be provided to the *A Learning Alberta* Steering Committee and will feed into the development of a preliminary vision for the advanced education system. The proposed vision will be presented to stakeholders for their consideration at the Minister's Forum, scheduled for the Fall of 2005. Individuals and groups interested in providing comments to this document may submit responses no later than August 19, 2005 to:

Phil Gougeon
Assistant Deputy Minister
Alberta Advanced Education
7th Floor Commerce Place
10155 102nd Street
Edmonton, AB T5J 4L5

Alternatively submissions can be provided by e-mail to: alearning.alberta@gov.ab.ca.

2 Context and Background Information

2.1 Defining Innovation

Before considering issues related to innovation it is important to develop a common understanding of what defines innovation. Widely ranging concepts of innovation have been articulated across all sectors of Canada's innovation system. To some, innovation refers to research and development activities occurring within Canadian universities. To others, innovation involves not only research activities, but also commercialization and technology transfer funded and performed throughout an innovation system. The innovation system is comprised of private sector industries, research organizations, health and education institutions, and governments. Yet, a broader definition views innovation as any form of creative activity or thinking that takes place across all facets of life and work. Within this context, innovation may be defined as:

> *A process through which value is extracted from skills and knowledge by generating, developing, and implementing ideas.*[1] *Reaching the full potential of innovation means leveraging ideas and knowledge to enhance quality of life and economic development.*

2.2 Importance of Innovation to Quality of Life and the Knowledge Economy

Innovation is pivotal to sustaining and enhancing a high quality of life. For example, advancements made in health research lead to prevention and cures for diseases, ways to manage health conditions, and increases overall life expectancy. The discovery of how to transplant insulin-producing cells successfully has the potential to free diabetics from the burden of insulin injections and provides protection against significant health-related complications. Known as the *Edmonton Protocol*, this development made Alberta a world-leader in diabetes research. Other innovations in areas of law and justice have led to the creation of community justice programs and community-based policing. And, through innovation, communities have the potential to explore new avenues and seek creative solutions to deal with such issues as homelessness, waste management, or urban planning.

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[1] Adapted from the Conference Board of Canada's definition of innovation, *Solving Canada's Innovation Conundrum: How Public Education Can Help?*, 2003.

Quality of life is also linked to strong and vibrant economies. Alberta has gained much of its past and current prosperity from natural resources. However, how Albertans live and work are undergoing significant transformation resulting from changes in information, communications, technology, and the rise of the global, knowledge-based economy. A Statistics Canada report indicates that employment in high knowledge industries is growing at a much faster rate in Canada (84%) compared to low knowledge or primary industries (52%). For Alberta to maintain its economic standing in the globally competitive arena, it must build a strong knowledge-based economy.

Innovation in long-established economic sectors, such as energy and agriculture, can improve access to and management of resources, create new products, and attract new global markets. And leveraging new discoveries from such areas as nanotechnology can create knowledge-based, value-added industries and diversify Alberta's economy.

While natural resources are the foundation of a resource-based economy, a knowledge-based economy derives its resources and prosperity from people. Our success at unleashing innovation is intricately linked to our ability to create and utilize high quality knowledge and skills held by Albertans. This means raising the educational attainment levels across the province to ensure Albertans are prepared for the 70% of new jobs that will require a post-secondary education.

Along with the skills demands of the knowledge-based economy is an anticipated need to meet future labour demands. Alberta's current low unemployment rate and reported shortages in specific occupations may be amplified in the future as baby boomers retire in increasing numbers. Moreover, Canada's productivity levels lag behind the United States and other industrialized countries. Statistics Canada reports that Canada's labour productivity growth in 2004 was at its lowest level in eight years, and there are suggestions that productivity may continue to slow as the workforce ages and employees seek a better balance between work and personal life. Innovation will play a pivotal role in seeking ways to meet productivity challenges presented by the aging workforce and potential labour shortages.

2.3 The Role of the Advanced Education System in the Innovation System

A broad concept of innovation recognizes that creating and implementing new ideas and new ways of doing things occur across a variety of settings. Most assessments of innovation in Alberta identify a growing complexity among funders and performers of research and innovation in the province. Along with post-secondary institutions, provincial and private sector research institutes, federal and provincial governments, funding agencies, industries, entrepreneurs, venture capitalists, and marketing firms all perform important roles in the innovation process.

While innovation begins with people, an innovative culture, and a depth of knowledge and skills, there are few boundaries on where and how innovation is applied. Innovation may conjure an initial image of university scientists working in labs to discover the latest scientific and technological breakthrough. Yet, innovation also applies to the welder on the shop floor who develops a new way to strengthen joint welds, or the business manager who improves productivity on the manufacturing line through employee wellness programs. It can also be applied to the graduate student who discovers a new use for Geographic Information Systems, or the teacher who enhances learning through the use of computer technology.

Although the broad scope of innovation and the complexity of the innovation system are recognized, for the purposes of this paper it is important to consider innovation in the context of advanced education. Clearly, advanced education serves numerous and significant functions within the innovation system: knowledge development and transfer; building human and social capital; stimulating creativity; and actively engaging in research and development activities. Through education and training, post-secondary institutions create a highly skilled labour force to support the knowledge economy. They develop competencies among students that support innovation, such as communication, creativity, and critical thinking. Institutions of higher learning house physical infrastructure, human resources and vast repositories of knowledge and information critical to the innovation process. Finally, they are also primary performers of research and development.

The complexity and diversity of these functions raise an overarching question: what is the primary purpose and objective of research and innovation within the advanced education system? In a publicly funded and learner-centred system, research and innovation should ultimately demonstrate benefits to students as well as the broader society. Benefits may be measured in terms of graduates obtaining relevant skills, knowledge, and competencies that allow them to reach their personal and career goals. Social benefits may include advancements in standards and quality of living as well as economic prosperity.

2.4 Draft Principles to Guide Innovation in Alberta

The *A Learning Alberta* initiative provides an opportunity to consider and confirm guiding principles to assist Alberta in fostering innovation. The following is a set of draft principles intended to frame the discussion on the scope, purpose, and overall objectives for innovation in Alberta. As a draft set of principles, these concepts identify the types of values that could potentially serve as a framework to guide policy decisions on innovation. We seek your feedback on whether these principles are appropriate to build a general framework to guide innovation within the post-secondary system.

Knowledge-based: innovation and knowledge are strongly interrelated since the foundations of innovation relate to skills developed through learning and education: the ability to read, write, communicate, think critically, analyze and solve problems, learn independently, adapt to a range of situations, and work with others.

Cross-fertilization: to support a knowledge-based economy and innovative society, ideas and information must flow across learning institutions, industries and employers, as well as the volunteer and public sectors. Knowledge acquisition, knowledge development, and knowledge transfer extend beyond Alberta's borders to the broader national and global world.

People-centered: our capacity for innovation depends on high levels of human capital developed through educational attainment, skills development, and values that support innovation. Innovation improves the economic prosperity and quality of life of Albertans.

Long-term perspective: innovation is a dynamic, non-linear process that leads to higher standards of quality of life, productivity, and prosperity over the long-term. Embedding a culture of innovation within Alberta requires long-term strategies that foster values supporting innovation.

Network-based: innovation takes place within a system and is fostered by the creation of communities of interest. An innovation system involves different actors across public and private sectors.

3 Challenges and Opportunities

The challenges and opportunities identified below have significant implications for creating and sustaining a high level of capacity for innovation in Alberta. Some of the issues pertain to the role of the advanced education system in meeting the broader needs of the innovation system. Other issues more directly relate to innovation and research activities that occur with the advanced education system.

3.1 Fostering Values to Support Innovation

Cultivating innovation not only requires building a knowledge society and supporting research and development activities – it requires embedding a set of shared values into the broader society and more actively creating a culture of innovation. The literature on building a culture of innovation is clear that a lack of appropriate values and attitudes, more so than investment or infrastructure, present the greatest barrier to innovation. In fact, some suggest that a homogenous society holding deeply held beliefs and widespread norms is less likely to develop a strong culture of innovation. In this way, respect for diversity forms a strong foundation for innovation, based on a capacity to value and explore new ideas and accept various perspectives. The following values are most often attributed to societies with a strong culture of innovative:

- Diversity – a willingness to look beyond a certain viewpoint and value new ideas.
- Adaptability – the capacity to foresee the need for change, and the ability to generate as well as accept change.
- Risk-taking – a capacity to understand and manage risks, a willingness to accept risks, and recognition that failure should not be stigmatized.
- Collaborative – a willingness to engage in teamwork, and share ideas and knowledge to stimulate creativity.

Some of Albertans' core values support innovation, particularly a pioneering spirit that appreciates self-reliance and risk taking. This pioneering spirit is often attributed to a high level of engagement of Albertans in entrepreneurial activities. In fact, the predominance of small and medium enterprises (SME) is evidence of the willingness of Albertans to engage in independent, and sometimes risky, commercial activities. Albertans also demonstrate a willingness to work together to solve problems, evident in the high rate of volunteerism – the second highest in Canada according to Statistics Canada.

A considerable challenge in creating a learning society and culture of innovation is the long-term process required to foster and reinforce values. Developing values for lifelong learning as well as creative and innovative thinking begins at early stages within early childhood education and the K-12 education system. Although the advanced education system has an enormous stake in increasing educational attainment and participation levels, it is critical that the process begins before students reach post-secondary levels. Enhanced collaboration among all sectors of the learning system may be required to develop and implement a common strategy to foster values supporting innovation.

Questions for Consideration:

1. Albertans have a strong set of values consistent with an innovation culture. In what ways can the values supporting innovation be further strengthened?
2. In what ways can collaboration be enhanced across the entire learning system to cultivate an innovative culture in Alberta?

3.2 Increasing Alberta's Human Capital to Support Innovation

Increasingly, establishing a strong base for innovation will necessitate higher levels of educational attainment for all Albertans. Moreover, the need for high quality, skilled people is not limited to technological industries, but is evident in a diversity of occupations and industrial sectors. Meeting these challenges forms the underlying rationale for expanding access to advanced education by 60,000 learning opportunities by 2020.

However, demographic shifts, particularly a decrease in the 18-24 age group, means that participation rates must increase – especially among disadvantaged Albertans who are less likely to pursue higher learning. It is likely this could increase demand for literacy

and basic upgrading programs, as well as demand for shorter-term certificate and diploma programs. At the same time, demands to expand graduate level studies are emerging from the need to increase research and innovation in the province and support the knowledge economy.

Ultimately, expanding educational opportunities in a learner-centred system means expansion must be driven by student demand. Responding to student demand must be coupled with continued efforts to ensure that programs are relevant and demonstrate positive outcomes for learners. A key challenge for the advanced education system is ensuring an appropriate balance in meeting student demands as well as the needs of the innovation system and the knowledge-based economy.

As an important component of research and innovation, expanding graduate student enrolment requires specific consideration. Expanding graduate enrolment is upheld as a critical strategy to increase our research and innovation capacity in the province. Our success at increasing graduate enrolment depends upon numerous factors: sufficient levels of investment to create opportunities and provide student support; attraction and retention of tenured faculty as well as students with high academic achievement in a globally competitive environment; and competition against a strong labour market that may entice students to enter the work force rather than pursue graduate studies. It is also important to consider the receptor capacity of the labour market for masters and doctoral degree holders across the broad range of disciplines and programs.

Alberta is among the provinces with the highest net inter-provincial migration rates in Canada. Approximately 60% of all those who move into Alberta from other provinces hold post-secondary credentials. However, retention rates among those with college and trade credentials are considerably higher than for Masters or Doctoral degree holders. In a given year, Alberta gains just over 2,000 people with graduate level credentials from other provinces. However, it looses about 1,800 graduate degree holders, leaving a net gain of about 10%.

On one hand, this may be viewed as a significant retention issue. On the other hand, it could be argued that high mobility among graduates of masters and doctoral programs supports cross-fertilization of knowledge and contributes to the creation of national or global networks and communities of interest. Masters and doctoral graduates educated in Alberta may not be working within our borders, yet may be still linked to Alberta's innovation system. Through a broader lens, the issue may be less about ensuring Alberta retains people with graduate level credentials and more about ensuring Alberta receives benefits from those who are educated within its advanced education system.

Alberta also does fairly well on attracting international immigrants with high educational qualifications. Most international immigrants arriving in Alberta in 2003 had high levels of education: 44% held a university degree, 11% held a college level credential, and 5%

held a trade certificate. Yet Alberta is not a primary destination for immigrant compared to Ontario, Quebec and British Columbia. Across Canada, immigrants comprise 17.5% of the total population, but only 14% of Alberta's population. Strong competition among international jurisdictions impacts on Alberta's ability to attract and retain skilled workers, graduate students, and faculty. Moreover, as emerging economies such as India and China begin to offer more attractive opportunities for highly qualified people, competition is likely to increase.

The capacity to attract and retain skilled workers, high quality students, and leading researchers and faculty is dependent on many factors including wages and standards of living, the reputation of industries, firms, or post-secondary institutions, and the presence of colleagues and/or communities of interest. Alberta, and post-secondary institutions in particular, will need to market themselves as attractive, high quality places to live, work, and engage in research and innovation.

Questions for Consideration:

1. How might an appropriate balance be struck between increasing human capital across a broad spectrum of programs and targeting investment in priority areas?
2. What options are available to enhance Alberta's ability to attract and retain high quality students and faculty?

3.3 Ensuring Knowledge Development and Knowledge Transfer

The advanced education system, particularly research-intensive universities, is often viewed as the central focus of innovation activities in Alberta. The high level of sponsored-research revenue received by the universities, as well as advanced scientific and technological discoveries in the province provide evidence of our success in research and innovation. Yet our advanced education system has another significant, but sometimes overlooked, role in building innovation that goes beyond formal R&D activities. In creating a highly educated and skilled labour force to meet economic and social needs, Alberta's advanced education system has a pivotal place in ensuring knowledge is effectively transferred from the educational system into the economy and broader society.

This means that Alberta's capacity for innovation depends not only on R&D activities, but the ability of our educational system to develop essential skills, employment-related competencies, and occupationally specific knowledge. Post-secondary institutions provide a fertile environment within which knowledge, skills and competencies may be developed. Institutions of higher learning are upheld as places where innovative, creative, and critical thinking flows freely. As such, learners are the conduit through which knowledge, skills, and competencies to support innovation are transferred to Alberta's economy and society.

Along with increasing demand for post-secondary credentials among employers, there is also rising interest in workers who can demonstrate basic employability and innovation skills: the ability to communicate and share ideas, work both cooperatively and independently, demonstrate a capacity for ongoing learning, an ability to be flexible and adaptable, and the ability to think critically and creatively. While some post-secondary programs are geared to training in specific occupations, other programs focus more broadly on developing general competencies. The ultimate objective for advanced education is to ensure learners are prepared for life and work. This means valuing both the substantive knowledge gained through advanced education programs as well as the development of general competencies.

Working more closely with employers and industries is one avenue to enhance the employability of post-secondary graduates and ensure effective knowledge transfer. Programs such as co-ops, internships, job-shadowing, and student mentoring are examples of business-community-education partnerships that work to increase foundational employment and innovation skills among students. At the same time, employers may build a greater appreciation of both the level of knowledge and the competencies demonstrated by Alberta's post-secondary students and graduates.

Questions for Consideration:

1. How can Alberta ensure knowledge is transferred effectively across all facets of Alberta's social and economic sectors, including the educational system, employers, and communities?
2. In what ways might supporting the development of general foundational skills to support innovation be balanced with the need to provide employment-related knowledge and skills?

3.4 Enhancing Inter-Disciplinary and Multi-Sectoral Collaboration

Some of the most significant attributes of an innovative society are diversity and a multiplicity of perspectives. Certainly many believe that research and innovation is fostered by cross-fertilization, interdisciplinary approaches, and the creation of communities of interest comprised of a variety of actors – researchers, technicians, post-secondary institutions, funding agencies, venture capitalists and entrepreneurs. Under this approach, unleashing innovation requires the development of strong relationships among business, labour and the learning system. As part of a collaborative innovation system, post-secondary institutions must be in tune with global innovation processes and the latest developments. At the same time, they must also have high awareness of the needs of regional economies and local communities.

On the one hand, thanks to the ease of global communications, communities of interest can now develop into intensive networks that spread out across the world. On the other hand, economic and technology sectors that cluster in specific geographic locations are also believed to spur research and innovation. Economic clusters tend to attract various

interests such as business, investors, researchers, and service supports that create a critical mass in a specific locale and area of innovation. Similarly, research centres of excellence create critical mass by concentrating knowledge and resources on specific research priorities. The concentration of a critical mass improves relationships among the various sectors and strongly supports high levels of communication and collaboration that enhance innovation, research, and commercialization activities. Post-secondary institutions are often upheld as having a key role to play in innovation clusters, including providing physical infrastructure, supplying the labour market with skilled graduates, and acting as a repository for expertise and knowledge.

Beyond creating clusters and centres of excellence, innovation in Alberta may be cultivated by less formal partnerships among educational institutions, private sector industries and employers, government, and the volunteer sector. By working closely with both the public and private sectors on assessing labour market needs, post-secondary institutions improve their responsiveness to changing economic conditions. Numerous benefits are also available to both employers and students who participate in co-op education, internships, and mentoring programs. Exposure to a diversity of work environments enhances students' occupational knowledge and develops practical work-related skills and competencies. For employers, post-secondary students and graduates enter the worksite holding the latest knowledge and fresh perspectives.

Currently, Alberta's advanced education system provides the majority of infrastructure and human resources devoted to R&D, and performs the greatest proportion of research activities in the province. Although resource availability has grown considerably, private sector involvement in R&D remains lower in Alberta than in other provinces. While 40% of Alberta's gross expenditures are attributable to private sector R&D, this percentage reaches 65-70% in Ontario and Quebec. In part, this is the result of the nature and structure of Alberta's economy that supports the existence of a high proportion of small and medium sized enterprises (SMEs). While SMEs often engage in informal research and innovation integrated with other activities, they are less likely to have the capacity to engage in large-scale, formal research and development.

Question for Consideration:

1. In what ways might private sector businesses and industries be encouraged to support education, training, and innovation in collaboration with post-secondary institutions?

3.5 Balancing Pure, Strategic and Applied Research

Currently, research conducted within Alberta's research-intensive universities comprises levels of both pure and applied research. The primary objective of pure or basic research is to acquire and advance new knowledge. It is often exploratory or theoretical and provides the foundation for further, more applied research. Applied research may also be original work to acquire new knowledge, but it usually has a specific application. In many ways, the boundaries between pure and applied research are not necessarily clearly

delineated. Although either type of research may be sponsored or funded by government or industry, it is sometimes easier to access sponsored research dollars for more tangible projects. Within the advanced education system, there is a demonstrated need for, as well as benefits arising from, conducting both types of research.

In considering the challenge of balancing pure and applied research is the issue of where, when and how to provide investment and other resources to support innovation. This means a closer examination of where innovation takes place within the advanced education system. On one level, support is required to create the environment in which knowledge and competencies are developed, and pure or basic research advances new theoretical ideas. At this level, institutions, faculty and students require the appropriate tools needed for creative and innovative thinking. At another level, support is also required for specific research areas – areas of strategic importance, where a critical mass is being reached in terms of physical, human, and knowledge-based resources, or where research is demonstrating the potential to produce promising results. Often, identifying where support should be targeted is a considerable challenge since it is not always clear where the next big idea will come from. A key challenge is balancing among providing base support to create the environments that support innovation, supporting broad research activities to spur innovation across the full range of disciplines, and supporting more highly developed research areas.

The recently proclaimed *Post-secondary Learning Act* includes a provision to allow colleges and technical institutes to engage in applied research. In the early stages of building an applied research component within the college and technical institute sector, several issues are evident. Of key importance is creating sustainable levels of capacity among the institutions. While some institutions have already established a higher capacity to conduct applied research, others are in the early stages of considering how applied research may fit within their mandates. In order to engage in applied research, institutions must have the necessary tools – mandates, faculty, physical infrastructure, and/or eligibility for sponsored research funding.

Considering that colleges and technical institutes are only authorized to conduct applied research, defining what applied research might mean within the context of the learning system is also a critical step. Beyond demonstrating practical applications for research, a definition of applied research might include the provision of strong collaboration with private sector, government, or other post-secondary or research institutions. It might also include the provision that applied research activities be conducted on a cost-recovery basis, or a requirement that learners be integrated in applied research activities.

Questions for Consideration:

1. In what ways can the advanced education system balance support for both pure and applied research?
2. Where and when in the innovation process may strategic priorities be identified for targeted support?
3. How might we define applied research as distinct from pure and basic research? What components might be included in a definition of applied research?

4 Key Questions

The purpose of this document is to obtain stakeholder feedback on how to best to support innovation and develop a culture of innovation in Alberta. To help guide written submissions prepared in response to this document, key questions are identified below.

1. Have all the challenges and opportunities been identified in this document? Are there other issues impacting Alberta's capacity for research and innovation?
2. Do the draft principles represent a complete framework to support and stimulate innovation in Alberta? If not, what other principles might be appropriate?
3. Are Alberta's educational, social and economic organizations effectively linked to sustain a culture of innovation and ensure knowledge transfer among sectors?
4. What incentives are available to ensure private and community organizations are taking an active role in education, training, and innovation?
5. How can Alberta foster and reinforce core values to support a culture of innovation?